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RADIUM

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The discovery of the new metal, radium, seems to be one of the very greatest importance both from a practical and scientific standpoint, and, as we as nurses are pleased to count ourselves among those who take an interest in scientific progress, a description of this remarkable element, gathered from the many newspaper accounts and magazine articles, but without their tiresome and often incomprehensible technicalities, may be interesting and instructive to those who have not the time or, perhaps, the inclination to do their own weeding.

Radium is one of three elements which are spoken of as "radioactive elements," all differing widely from one another in many ways, but possessing one property in common: they emit spontaneously certain peculiar rays called Becquerel rays, which act on photographic plates, produce heat and light and many other important effects. These rays, to which his name has been given, were discovered quite by accident by Professor Henri Becquerel, of the University of Paris, in 1896. He undertook some experiments to test a theory advanced by several French physicists that X-rays might be produced if phosphorescent substances were exposed to sunlight instead of the electrical action of a Crooke's tube. A mineral containing the metal uranium was placed upon a photographic plate and wrapped in dark paper. A storm came up before the experiment was completed and postponed it for several days, during which time the plates were left in a darkened room. When the work was resumed, thinking some change might have taken place, he developed the plates instead of leaving them to be destroyed, and the result was better pictures than he had ever obtained before—all due to the rays from the mineral, the exposure to sunlight not having affected it in the least.

Further investigation, however, proved that the rays produced by uranium were too feeble to be of any practical value, and M. Becquerel's discovery would have aroused little interest had it not led to the more important one of this unique element, radium.

It is interesting to know that its discovery was due primarily to a woman, Mme. Sklodouske Curie, in consequence of which she now ranks among the most prominent scientists of the day.

Mme. Curie began her work in 1897, and the task she set for herself was like searching for specks of dust in a sand-hill or "drops of perfume scattered in a river." She soon made the surprising discovery that minerals containing uranium were more radio-active than the metal itself. This led her to believe that some other and more active substance was present. A little later she was joined in the search for the new element by her husband, M. Curie, and together they solved the problem. Radium has not yet been completely isolated, but is obtained in some of its simpler compounds, chloride of radium being the commonest form and looking like ordinary coarse-grained salt. To secure one grain of the powder requires the treatment of half a ton of pitch-blende, the mineral from which it is produced. The removal of uranium reduces it to a lumpy, reddish powder, and this constitutes the raw material from which radium is extracted. Some idea of the tremendous amount of work and time involved in its extraction and manipulation may be gathered from the fact that out of tons of uranite powder and years of work only about a tablespoonful of the pure chloride of radium has been obtained. France and Germany each have about one gramme, America has a little less than that amount, and the rest of the world only about one-half gramme.

M. Curie thinks it is doubtful if there is much radium in the earth, and what there is seems to be so thinly scattered that the cost of taking out and purifying it is almost prohibitive. It has been estimated that under existing conditions radium is worth about three thousand times its weight in pure gold. An interesting fact has been noted lately, however, and that is that the air from deep borings in the earth and waters from mineral springs have been found to be radio-active. This would seem to indicate its presence in considerable quantities.

The properties of radium are extremely curious. It is spontaneously luminous, emitting a light which resembles that of the glowworm. It spontaneously charges itself with electricity, and possesses the property of liberating heat spontaneously and continuously with apparently no loss of weight or power.

Radium also has the power of communicating its radio-activity to surrounding bodies—a plate, a piece of iron or glass, anything with which it comes in contact. Thus a scientist or doctor unable to procure the metal may experiment with an object charged with its emanations as long as the charge keeps its potency.

Radium is an element of destruction, and too frequent handling will make the hands raw and sore. M. Becquerel, journeying from Paris to London, carried a small tube of the metal, to be used at a lecture, in his pocket. He felt no discomfort at the time, but two weeks later a sore, which became deep and painful, formed in the skin directly under the pocket and remained for weeks before healing.

The effects of radium on organic life, shown by experiments upon animals, is one of its most interesting and important properties. Animals exposed for any length of time to its rays lost their fur, became blind, and finally died. On the other hand, when exposed for a shorter time to radium of lower intensity or at a greater distance they have seemed to thrive under the treatment.

The most remarkable experiment performed, however, was that of arresting organic development. Little worms that live in flour were used for this purpose. After exposure to the radium rays the larvæ all died in a few weeks, with one exception, and at the end of four months he was still alive, a patriarch among his kind, having lived through three times his ordinary span of life. It was as if a human being should keep the appearance of youth for two or three hundred years.

Medicine seems to be the most promising field for the practical utilization of radium rays at present, and experiments are already in progress to determine how it may be made useful in the treatment of diseased conditions. It is early to speak of its results as certainties, but there are undoubtedly possibilities. In London and Paris such diseases as cancer, lupus, and other skin disorders have been treated with the radium rays for more than a year. The usual method is to enclose a small quantity of the metal between two small disks, the whole being about the size of a silver dollar. This is pressed against the affected part for fifteen minutes. The treatment is kept up day after day, sometimes for weeks and months, until the sores finally heal, leaving healthy white scars. It is hoped that air rendered radio-active may help sufferers from lung affections, and water rendered radio-active may be used in treatment of diseases of the stomach. Radium may possibly be used also as a means of diagnosis in cases of cataract. If a tube containing the powder be pressed against the closed eyelid in a darkened room, the individual immediately has a sensation of diffused light, thus showing that its rays have the power of making the liquids of the eyeballs self-luminous. Consequently the ability of a person blind from cataract to see the radium light means that the retina is intact and the eyesight may be restored by removing the cataract; otherwise such an operation is useless. Very extensive investigations are made impossible by the small amount of radium in existence. One of the things to be hoped for in the future is a simple and less costly method of extracting and purifying it.

Mme. Curie in her very interesting paper in the January *Century* said: "Research in all branches of experimental science, physics, chemistry, physiology, and medicine is impeded, and a whole evolution in science is retarded, by the lack of this precious and unique material, which can now be obtained only at great expense."